Windows EtherCAT® Real-time Platform based on Real-time Linux

Technical Presentation

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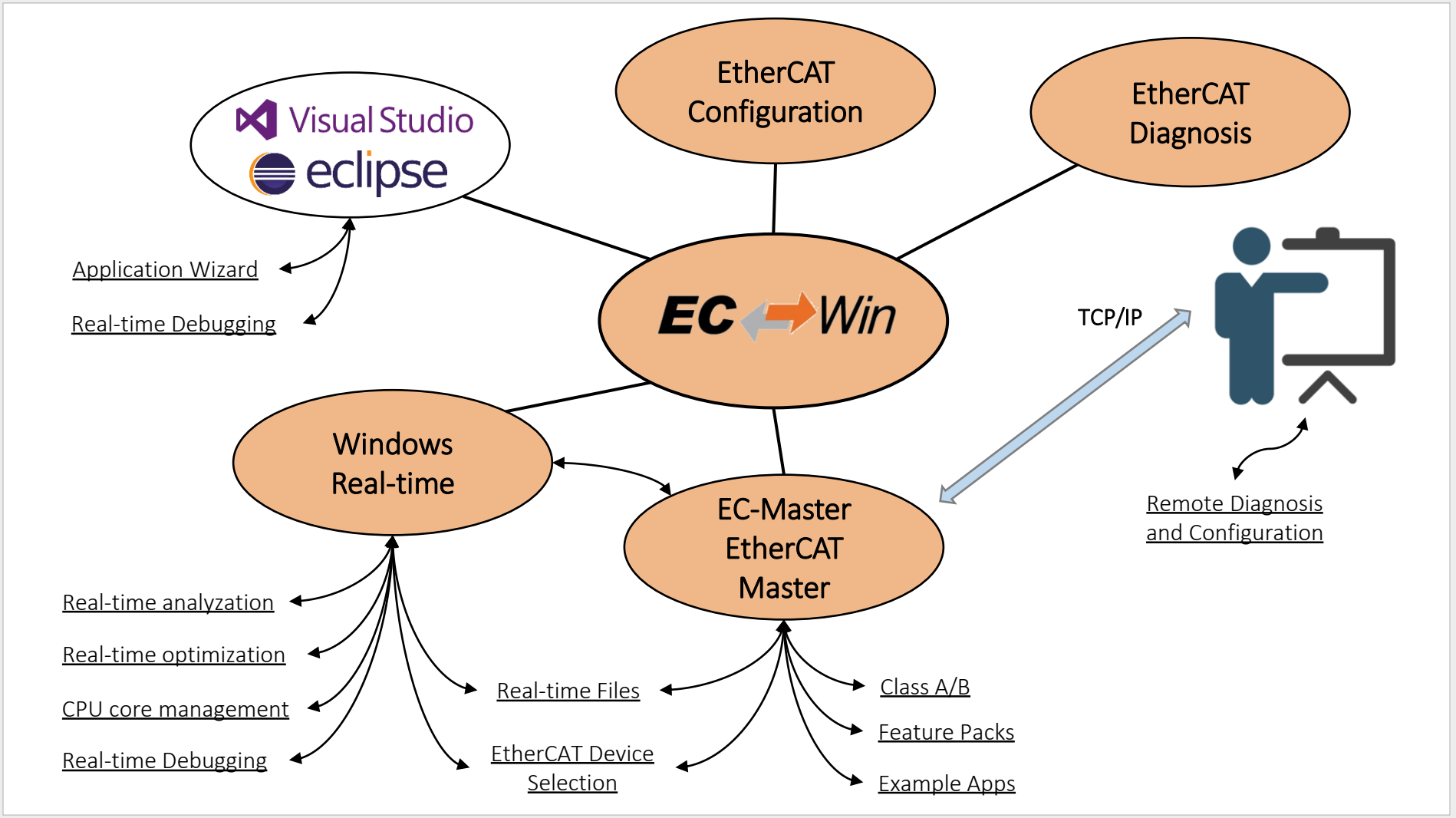
EC-Win (RT-Linux)
Fully integrated Windows EtherCAT platform



EC-Win (RT-Linux) – Components

- Core components
  - Windows Real-time extension based on Real-time Linux
  - EC-Master EtherCAT Master Stack for Linux
    - Running inside the real-time environment

- Optional components
  - EC-Engineer: EtherCAT Configurator Tool
  - EC-Lyser: EtherCAT Diagnosis Tool
  - EtherCAT Master Feature Packs
    - Hot Connect
    - Cable Redundancy
    - TCP/IP Remote API (to connect with Remote Gateway)

EtherCAT Integration

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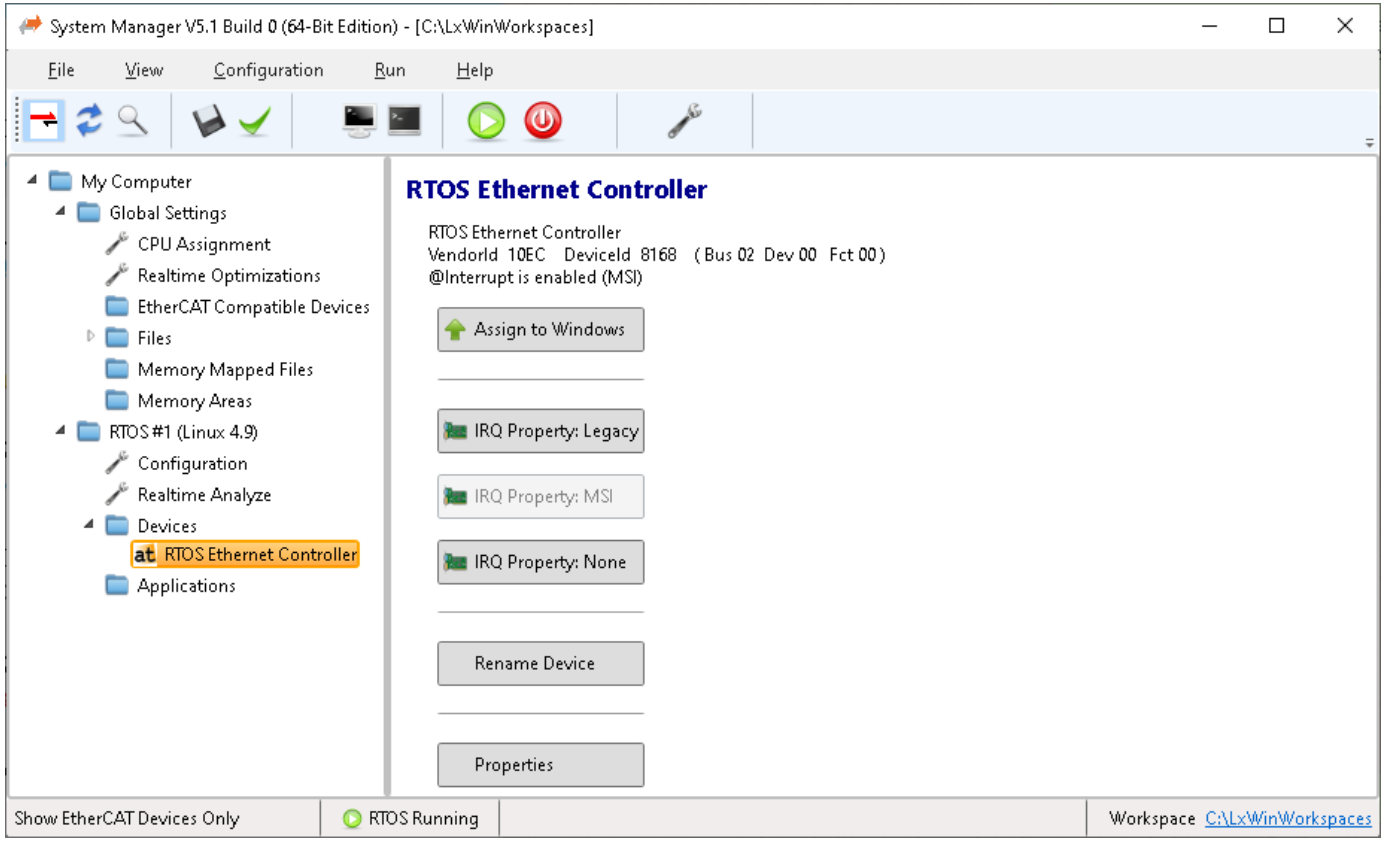
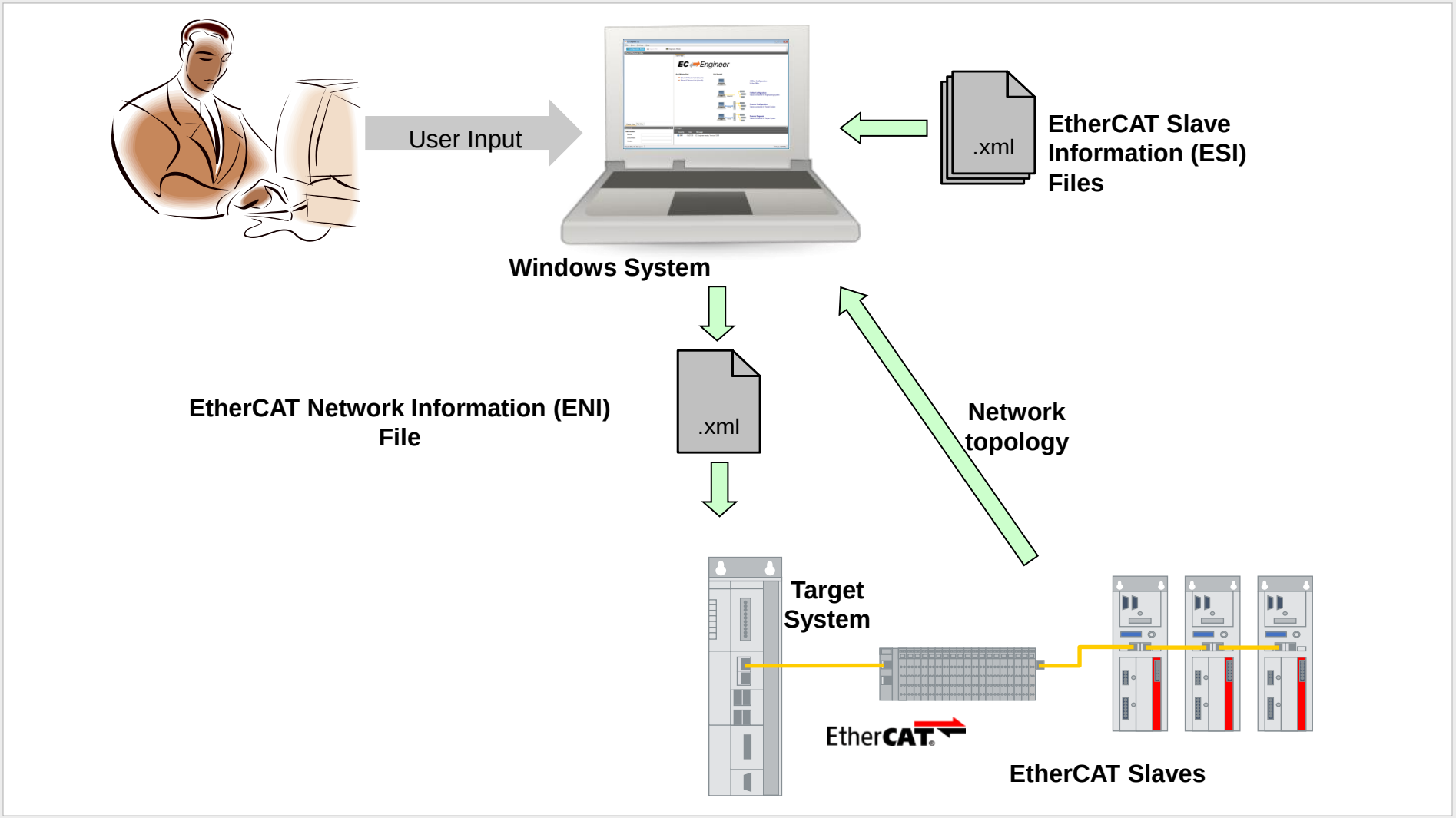
EtherCAT compatible Ethernet Controller

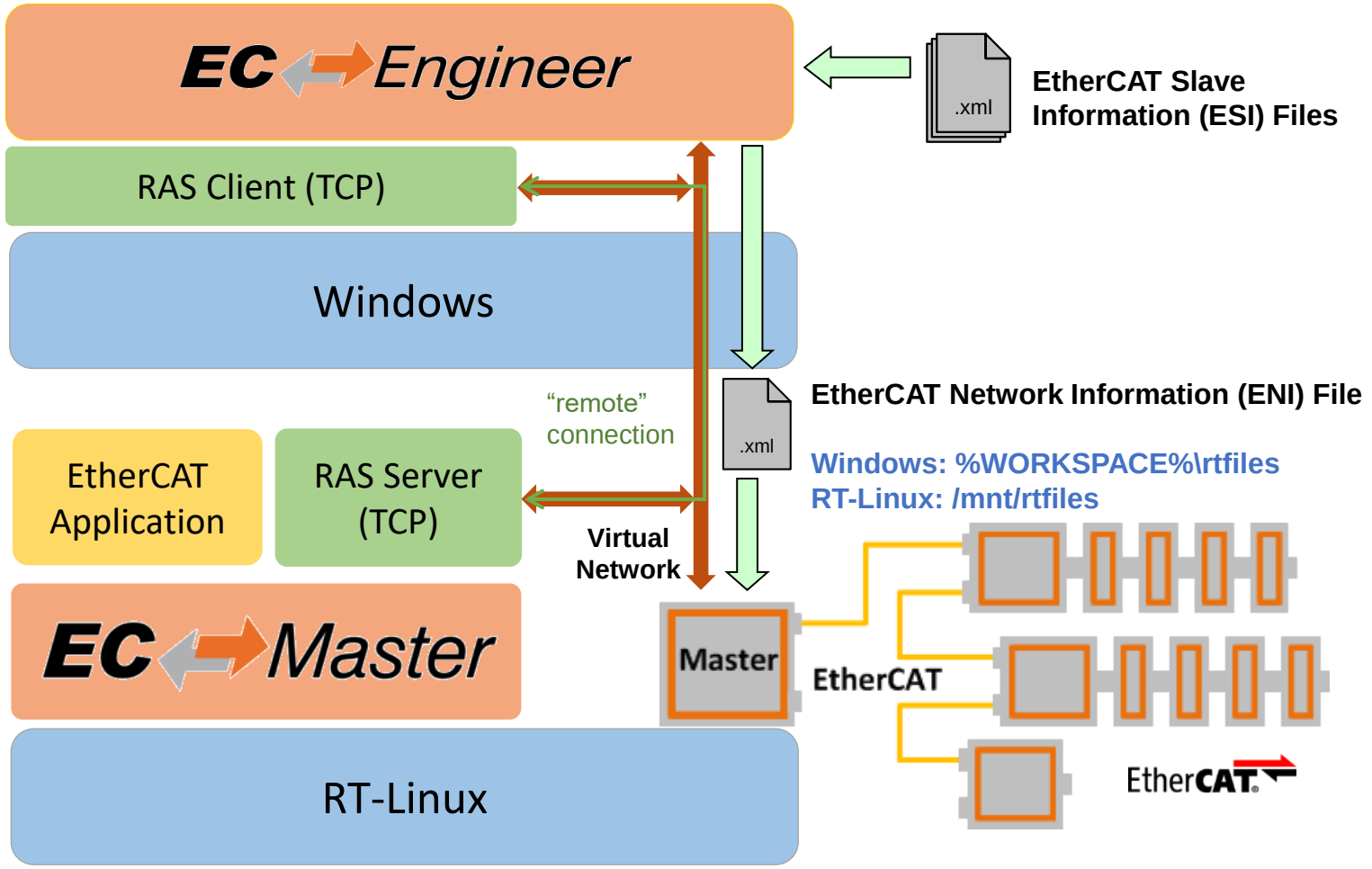
- Automatically detect all Ethernet Controllers that are supported by the EtherCAT master
- Assign to the real-time part



EtherCAT Network Configuration Data Flow



EC-Win (RT-Linux): “Remote” Configuration



Typical Workflow

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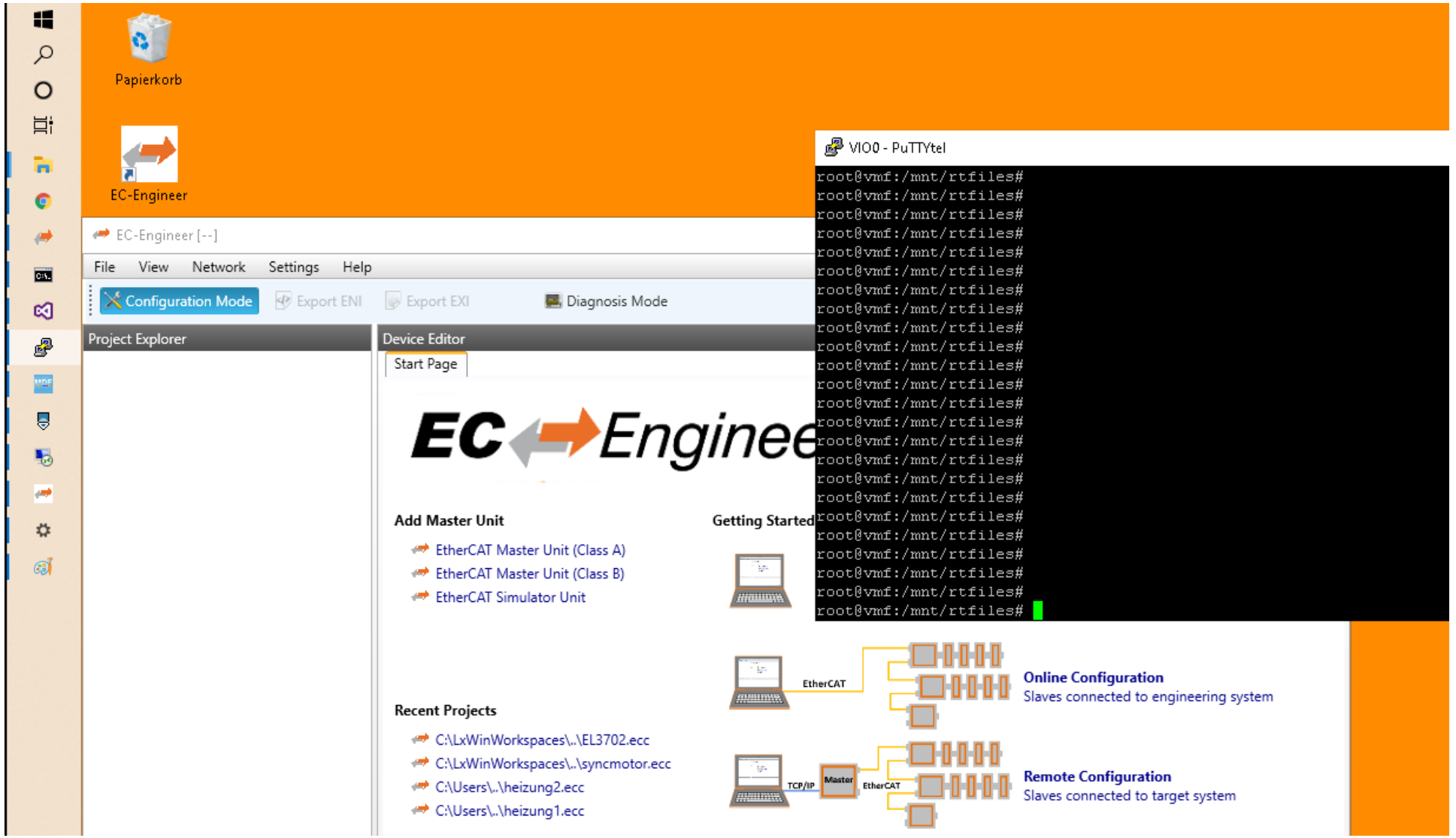
EC-Engineer and RT-Linux on the same machine



Step 1: run master without ENI

```
VIO0 - PuTTYtel
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
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root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles# ./EcMasterDemo -rtl8169 1 1 -sp
```
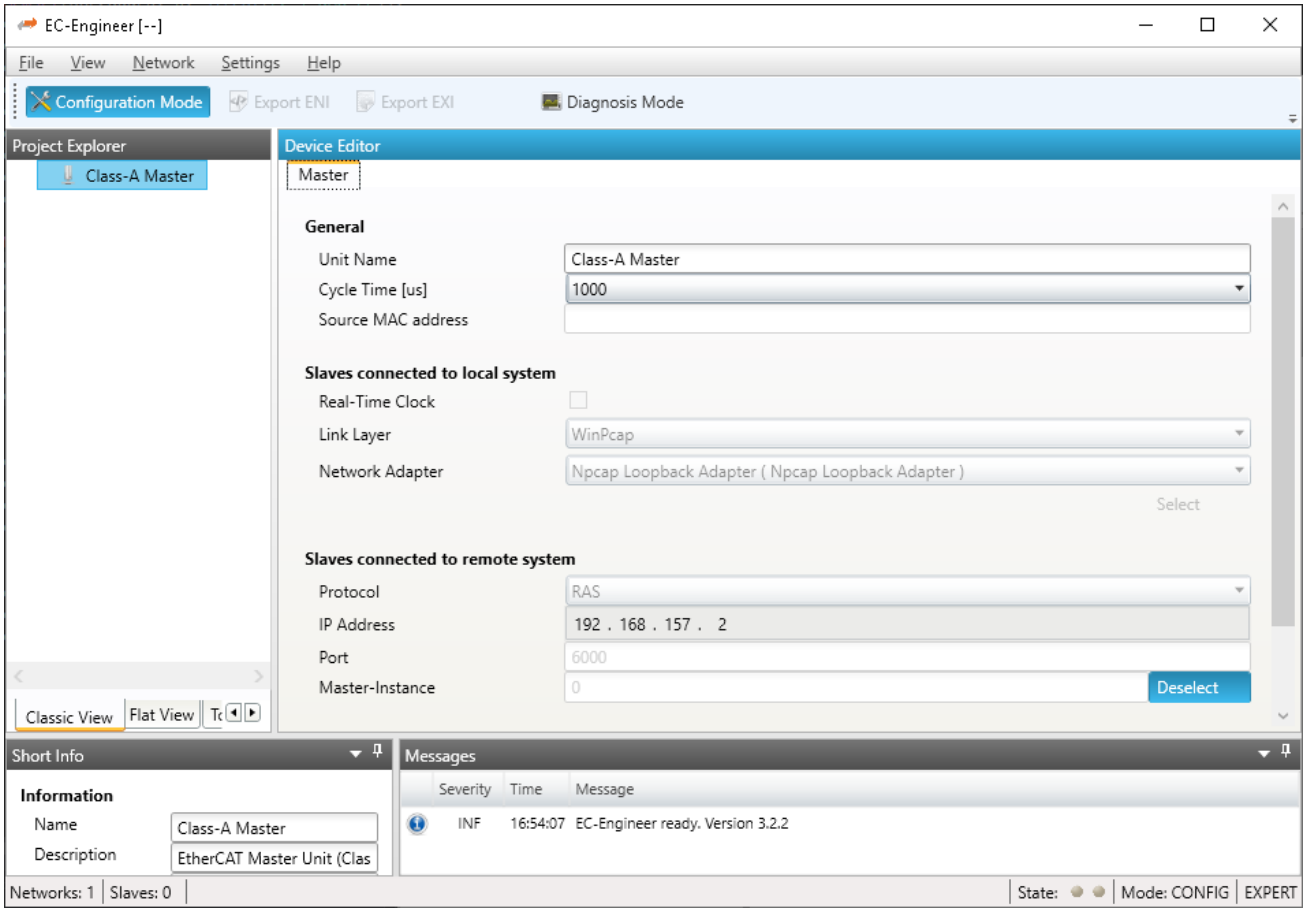
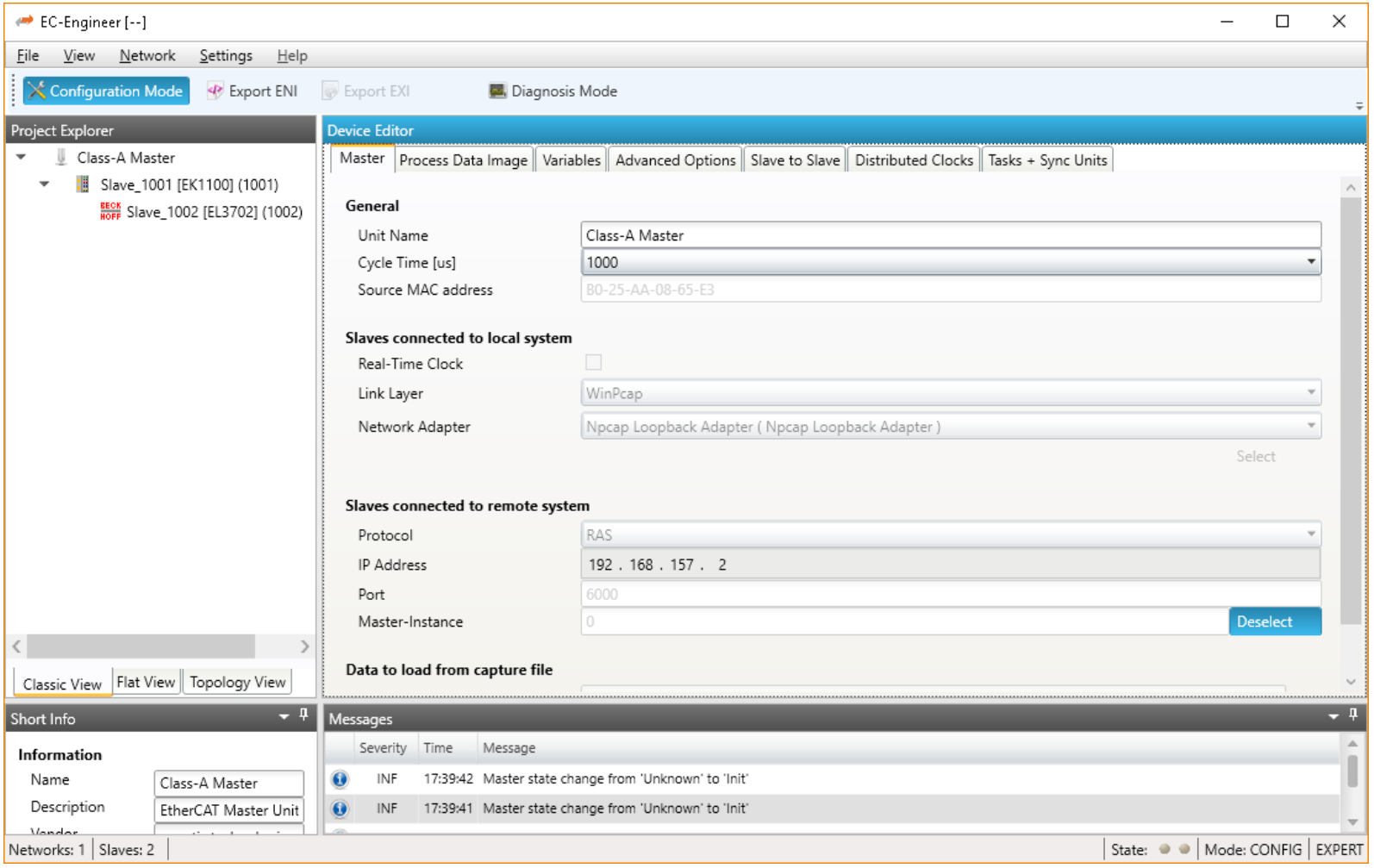

- Master demo application parameters:
  - -rtl8169 1 1 → use Realtek adapter, polling mode, first adapter instance
  - -sp → enable RAS server
  - Master scans net network and waits for remote connection to provide information to EC-Engineer

Step 2: EC-Engineer remote connection

- Default IP address: 192.168.157.2

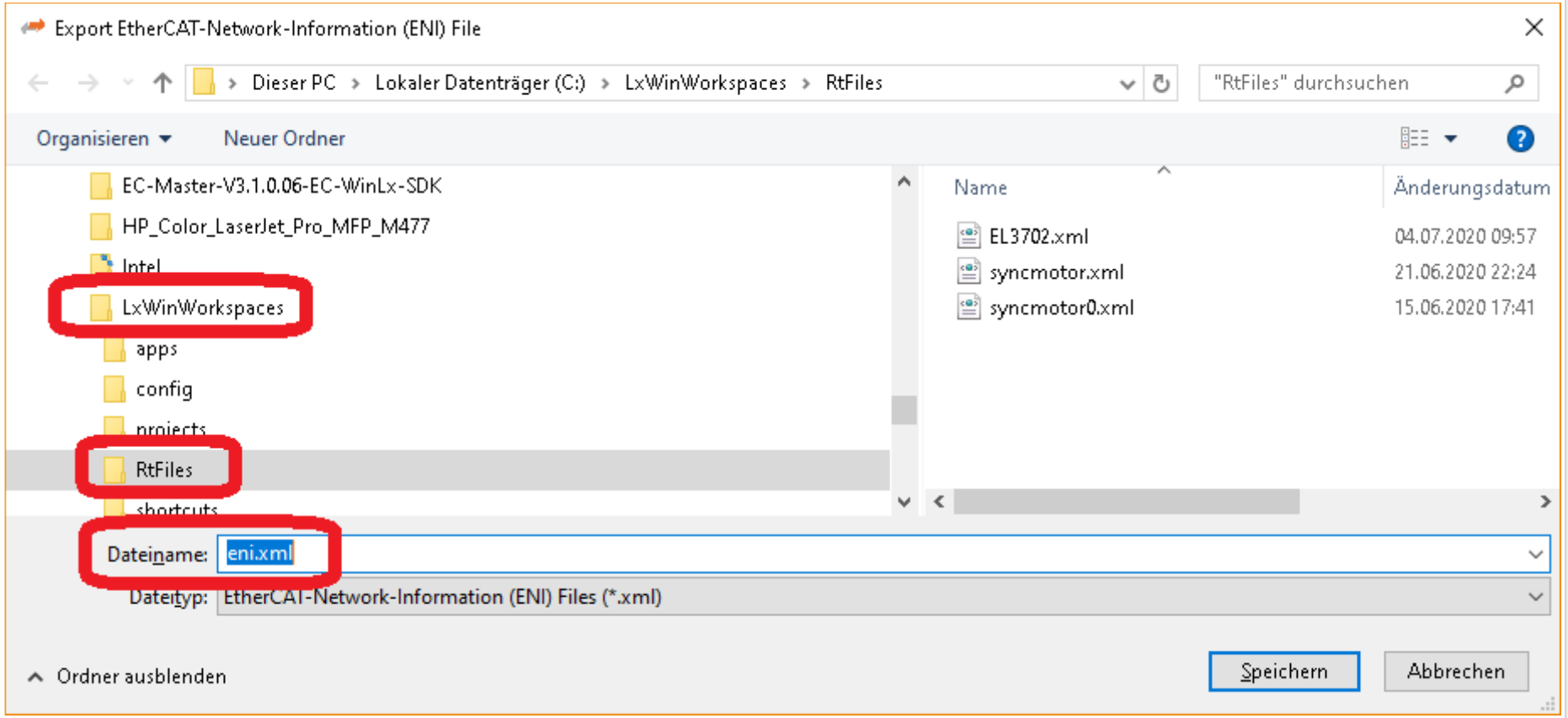


Step 3: Scan the network



Step 3: Export ENI

- Store in rtfiles directory in the LxWin workspace



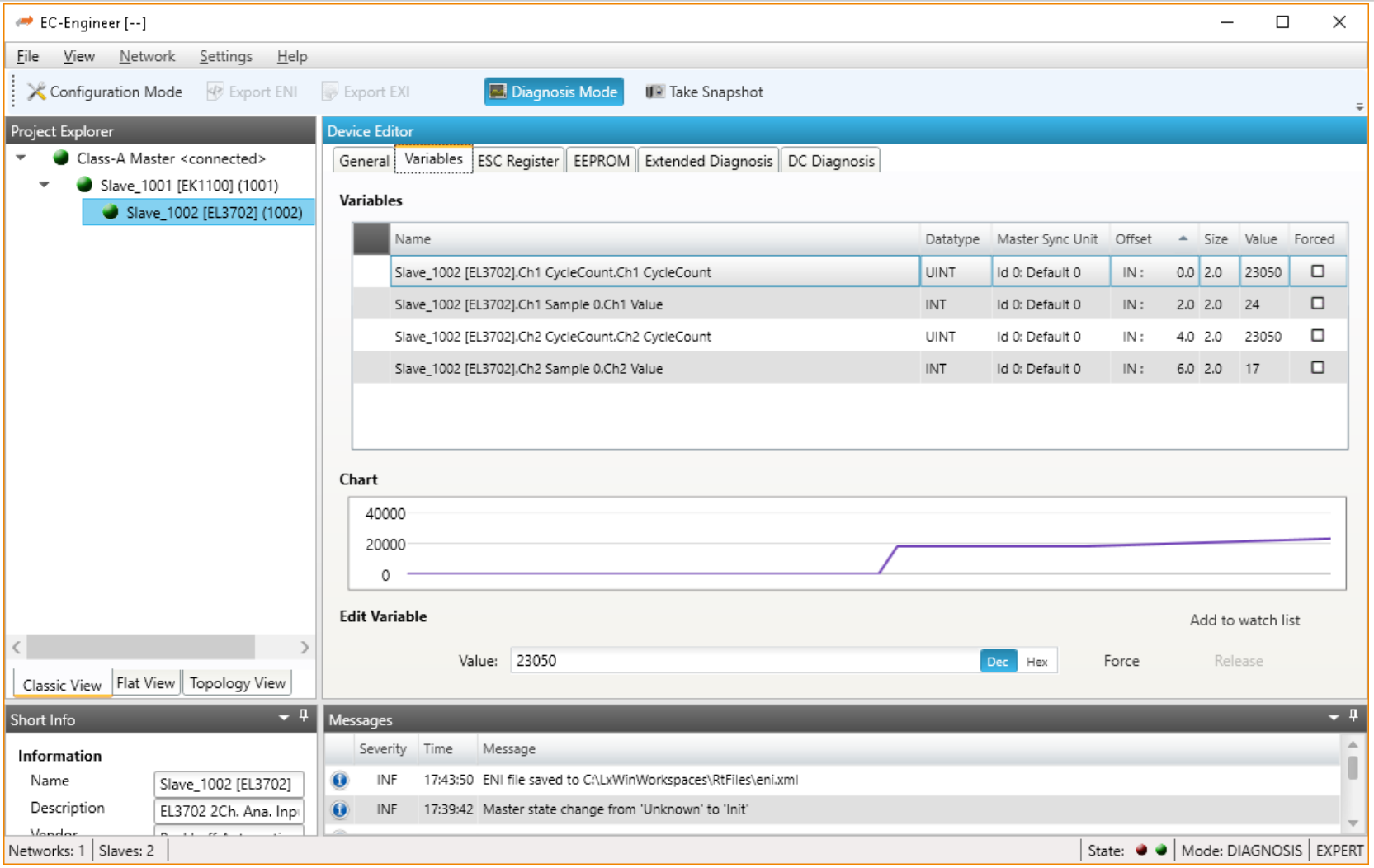
Step 4: run master with ENI

VIO0 - PuTTYtel

```
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles#
root@vmf:/mnt/rtfiles# ./EcMasterDemo -f /mnt/rtfiles/eni.xml -rtl8169 1 1 -sp
0000000043: Full command line: -f "/mnt/rtfiles/eni.xml"-rtl8169 1 1 -sp
0000000044: Start Remote API Server now
0000000045: EC-Master V3.1.0.06 for EC-WinLx_x86 Copyright acontis technologies GmbH @ 2019
atemsys: device_open(0xe8d78600)
atemsys: pci_find: ven 0x10ec dev 0xffff nInstance 0
atemsys: pci_find: device 0x10ec:0xffff:0 not found
atemsys: pci_find: ven 0x10ec dev 0x8169 nInstance 0
atemsys: pci_find: device 0x10ec:0x8169:0 not found
atemsys: pci_find: ven 0x10ec dev 0x8168 nInstance 0
atemsys: pci_find: found 0x10ec:0x8168:0 -> 0000:02:00.0
atemsys: pci_select: 0000:02:00.0
pci 0000:00:1c.1: Error enabling bridge (-19), continuing
PCI device used by VMF 0000:02:00.0
PCI device 0000:02:00.0 has VMF device ID 0 and uses interrupt ID 16 vector 240
atemsys: pci_conf: legacy INT configured for device 0000:02:00.0
atemsys: mmap: Doing PCI device sanity check
atemsys: mmap: mapped IO memory, Phys:0xd0604000 UVirt:0xb7764000 Size:4096
atemsys: mmap: mapped DMA memory, Phys:0x28e00000 KVirt:0xe8e00000 UVirt:0xb727f000 Size:528384
0000000063: EtherCAT network adapter MAC: B0-25-AA-08-65-E3
0000001082: Bus scan successful - 2 slaves found
0000001089: Master state changed from <UNKNOWN> to <INIT>
0000002010: Master state changed from <INIT> to <PREOP>
0000005007: DCM in sync Cur="   1155", Avg="      0", Max=" -29071"
0000005023: Cyclic command WKC error on LRD - Address: 0x10000000 - WKC act/set=0/1
0000005023: Master state changed from <PREOP> to <SAFEOP>
0000005033: Master state changed from <SAFEOP> to <OP>
```

- Master demo application parameters:
  - -f /mnt/rtfiles/eni.xml → ENI file exported before
  - Master sets network into OPERATIONAL

Step 5: EC-Engineer remote diagnosis



EC-Win (RT-Linux) Summary

- Fully integrated EtherCAT real-time solution
  - one vendor, one support contact
  - Acontis has expertise for Windows real-time extensions back to 1994 and is leading provider for EtherCAT software since 2005
- Key Features
  - Win32 real-time platform base on Real-time Linux
    - Most popular and de-fact standard RTOS
    - Deterministic and hard real-time
  - Microsoft® Visual Studio® support for the non-real-time and real-time part of the software
  - Class A EtherCAT Master Stack
  - High Performance real-time Ethernet Drivers
- All runtime components included: No additional license required
  - License for EtherCAT Class A Master Stack
  - License for RT-Linux based Windows Real-time Platform